Report on

Supplementary
Geotechnical Slope Stability Assessment
East Side Slope of Serson Creek
Lakeview Village, 800 Hydro Road
Mississauga, Ontario

Prepared For:

Lakeview Community Partners Limited



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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Lakeview Community Partners Limited to undertake a geotechnical slope stability assessment for the Serson Creek bank slopes for the proposed Lakeview Village development at 800 Hydro Road in Mississauga, Ontario.

In July 2019, DS Consultants Ltd. completed a geotechnical slope stability assessment for the <u>west side</u> <u>slope</u> of Serson Creek at the site, and the findings are documented in DS's previous report (No. 18-519-102) dated July 19, 2019.

This supplementary geotechnical slope stability assessment report is for the stability assessment of the <u>east side slope</u> of Serson Creek at site. The purpose of this study was to assess the stability of the existing east bank slope of Serson Creek and determine the location of the long-term stable top of slope (LTSTOS) line.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional Oborings and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Lakeview Community Partners Limited, its architect and designers. Use of this report by third party without DS consent is prohibited.

2. FIELD AND LABORATORY WORK

At the north part of the slope site where there in no existing boreholes near the east slope bank of the creek, three boreholes (BH20-1 to BH20-3) were drilled by DS Consultants Ltd. to refusal at depths ranging from 1.9 to 2.6m. The boreholes were drilled with portable equipment by a drilling sub-contractor under the direction and supervision of DS Consultants Ltd. personnel. Continuous samples were retrieved with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 312 N and dropping 760 mm. The blow counts were converted to standard SPT 'N' values. The samples were logged in the field and returned to the DS Consultants Ltd. laboratory for detailed examination by the project engineer and for laboratory testing.

2

As well as visual examination in the laboratory, all of the soil samples were tested for moisture content. Two selected samples were tested for grain size distribution and Atterberg Limits, and the results are shown in the borehole logs and on **Drawing 5** in **Appendix I**.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. A piezometer was installed in each borehole for stabilized groundwater level measurement.

The ground surface elevations at the borehole locations were surveyed by DS, using a differential GPS unit.

3. SUBSURFACE CONDITIONS

North Part of Site:

Three boreholes (BH20-1 to BH20-3) were drilled by DS Consultants Ltd. at the north part of the site. The borehole location plan, borehole logs, and grain size analysis results are presented on **Drawings 1 to 5** in **Appendix I**. The subsurface conditions in the boreholes are summarized in the following paragraphs.

In BH20-1 to BH20-3, a topsoil layer of 150 to 200 mm in thickness was found below surface. Below the topsoil, fill material was found, extending to depths ranging from 0.8 to 1.5 m. The fill consisted of stiff to very stiff clayey silt, with inclusions of topsoil and organics.

The native soil below the fill consisted of very stiff to hard silty clay till, extending to the explored depth of the boreholes. The till contains some sand and trace to some gravel.

Grain size analyses of 2 silty clay till samples (BH20-1/SS2 and BH20-3/SS3) were conducted and the results are presented in **Drawing 5** in **Appendix I** and on the borehole logs, with the following fractions:

Clay: 28 to 37%

Silt: 46 to 49%

Sand: 11 to 15%

Gravel: 3 to 11%

The boreholes were found dry during the drilling operations. No groundwater was detected in the piezometers in the boreholes. In the slope area near the creek, the groundwater level will fluctuate with the water level in the creek.

South Part of Site:

WSP Canada Inc. carried out a geotechnical investigation for the WWPT watermain extension, documented in the report No. 171-16737-00, dated April 27, 2018. The report by WSP was provided to us by the client. In WSP's geotechnical investigation, six (6) boreholes (BH16-1 to BH16-3, BH17-1, BH17-2 and BH17-4) were drilled near the east bank slope of Serson Creek. The borehole location plan and

relevant borehole logs are attached in **Appendix II**. The subsurface information in these boreholes are used in this slope stability study.

In the boreholes, fill materials were found extending to depths of 1.2 to 3.4 m. The fill consisted of clayey silt, silty clay, sandy silt to sand. The fill was in a loose to dense state, with measured SPT 'N' values ranging from 6 to over 30 blows per 300 mm penetration. The native soils consisted of very stiff to hard cohesive deposits of clayey silt to silty clay (till) and dense to very dense cohesionless deposits of silt, sand, sandy silt to silty sand.

Groundwater in the boreholes was within 6 m below the surface. In the slope area near the creek, the groundwater level will fluctuate with the water level in the creek.

4. SLOPE CONDITIONS AND PROFILES

A site visit was made by a senior geotechnical engineer from DS Consultants Ltd. on July 20, 2020 to inspect the slope and creek conditions. Selected photographs taken during our site visits are presented in **Appendix III**. The subject creek slopes are located between Lakeshore Blvd and about 100 m north of Lake Ontario.

For the convenience of discussion, Lakeshore Blvd. in the area is assumed in the east-west alignment. There is an existing bridge for the access road from WWTP to the site. According to the slope conditions, the creek slopes are considered consisting of 2 reaches as follows:

- Reach S2 is located from the access road bridge to Lake Ontario, along the WWTP and the access road.
- Reach S3 is located from Lakeshore Blvd to the access road bridge.

In the area of Reach S3 (north of bridge, see Photos 1 to 10 in **Appendix III**), the slope conditions are described as follows:

- The slope in Reach 3 area was generally 2 to 3 m in height, with steepness of 2H:1V to 3H:1V or flatter. In some areas, the lower portion of the slope near the creek bed was steeper than 2H:1V.
- The slope surface is generally well covered with trees, grasses, bushes and other vegetation.
- The width of the creek was generally within 2 to 3 m. The water depth of creek was within 0.4 m during our site visit.
- No evidence of slope failure was observed during our site visit. Some erosions of the slope toe at the creek water level were observed at various locations along the creek.

In the area of Reach S2 (south of bridge, see Photos 11 to 28 in **Appendix III**), the slope conditions are described as follows:

- The previous trees in the creek and slope area were removed. The slope was generally covered with grasses and some wood debris.
- There is a steel chain fence along the east side of the creek. There was a berm of about 1 to 2.5m high near and along the fence. At the north part and south part of the site, the berm was located to the east of the fence. In some areas at the middle part of the site, the berm was located at or to the west of the fence. The steepness of the berm slope facing the creek was typically 2H:1V to 3H:1V.
- The height of the east slope in Reach 2 area, including the berm, was typically 2 to 4 m from the creek bed level.
- The width of the creek was generally 2 to 3 m. The water depth of creek was generally within 0.3m during our site visit. However, the creek bed in the area near the access road bridge was dry.
- No evidence of slope failure was observed during our site visit. No active erosion at the creek level
 water level was observed, as he creek bed was mostly covered with wood debris, grasses and
 cobbles/boulders.

The existing slope profiles at 14 Sections (A-A to N-N, see Figure 1A for locations) were provided to us by Urbantech, as presented on Figures 2A to 15A.

5. EROSION CONSIDERATIONS

In the Geomorphic Assessment Report by Beacon Environmental Limited, a long-term toe erosion allowance of 8 m is recommended for the Serson Creek bank slopes across the site (Reach S2 and S3). This recommended toe erosion allowance for the creek bank slopes is used in the slope stability assessment.

6. SOIL PARAMETERS

Based on the borehole information and our site observations, soil parameters used in the slope stability analyses are given on **Table 6.1**.

Table 6.1: Soil Parameters for Long-term Slope Stability Analyses

| Soil Type | Unit Weight (kN/m³) | Cohesion c' (kPa) | Friction Angle φ' (degree) |
|---------------------------------|---------------------------|-------------------------|----------------------------------|
| Fill | 20 | 0 | 30 |
| Silty clay/clayey silt deposits | 21 | 5 | 28 |
| Compact sandy silt to sand | 21 | 0 | 32 |
| Dense sandy silt to sand | 21 | 0 | 34 |

7. STABILITY ANALYSES OF SLOPES

The existing slope profiles at Sections A-A to N-N (see Figure 1A for locations) are presented on Figures 2A to 15A.

In the previous report (No. 18-519-102, dated July 19, 2019) by DS Consultants Ltd. for the stability assessment of the west slope of Serson Creek, stability analyses of existing slopes and stable slopes were carried out. It was concluded that a slope of 2.5H:1V, together with toe erosion allowance of 8m, is considered stable in terms of long-term stability for the west side slope of the creek. Based on the boreholes, the soil conditions at the east side of the creek are similar to the west side of the creek. Therefore, a slope of 2.5H:1V, together with toe erosion allowance of 8m, is also considered stable in terms of long-term stability for the east side slope of the creek.

As confirmatory analyses, stability analyses of the existing east slope at Section L-L has been carried out with the computer program SLIDE (Version 8) using the Simplified Bishop method, Simplified Janbu method and GLE/Morgenstern-Price method. The analysis results are presented in Figure 16A. The calculated factor of safety of the existing east slope at Section L-L is 2.08, which is greater than the CVC's minimum acceptable value of 1.5 for stable slope.

For long-term stability, a toe allowance of 8 m is also required for analysing the long-term stable slope.

In order to determine the long-term stable slope, analysis of a 2.5H:1V slope with a toe erosion allowance of 8 m at Section L-L have been carried out for the east slope, and the results are presented on Figure 17A. The calculated factor of safety of the 2.5H:1V slope at Section L-L is 2.25, which is greater than the minimum acceptable value of 1.5.

Based on the analysis results, it is confirmed that a slope of 2.5H:1V with a toe erosion allowance of 8m is stable and acceptable in terms of long-term stability for the east slope of Serson Creek.

8. LONG-TERM STABLE TOP OF SLOPE (LTSTOS)

Reach S3 (north of bridge):

Based on the slope stability analysis results presented above, Point "S12E" in Figure 17A represents the long-term stable top of slope (LTSTOS) of the east slope at Sections L-L. Accordingly, Point "S12E" is also shown in Figure 13A of the profile at Section L-L.

Similarly, the long-term stable top of slope (LTSTOS) of the east slope at other sections (J-J, K-K, M-M and N-N) can be obtained using a stable slope of 2.5H:1V and a toe erosion allowance of 8m, as shown in Figures 11A, 12A, 14A and 15A, respectively.

Based on the analysis results, the points representing the long-term stable top of slope (LTSTOS) at Sections J-J to N-N at the north part of the site are as follows.

- Point "S10E" on Figure 11A represents the long-term stable top of the east slope at Section J-J.
- Point "S11E" on Figure 12A represents the long-term stable top of the east slope at Section K-K.
- Point "S12E" on Figure 13A represents the long-term stable top of the east slope at Section L-L.
- Point "S13E" on Figure 14A represents the long-term stable top of the east slope at Section M-M.
- Point "S14E" on Figure 15A represents the long-term stable top of the east slope at Section N-N.

Based on the long-term stable top of slope (LTSTOS) at Sections J-J to N-N, and our field observations, the recommended long-term stable top of slope line (Line S10E-S11E-S12E-S13E-S14E) is shown on Figure 1A for east slope of Serson Creek at the north part of the site (Reach 3).

Reach S2 (South of Bridge):

In the area of Reach 2 to the south of the bridge, the existing slope profiles at Sections A-A to I-I, as shown in Figures 2A to 10A are provided up to the property line. The existing grade elevation to the east of the property line (i.e. beyond the property line) is not available. As shown in Figures 2A to 10A, the 2.5H:1V stable slope (with 8 m erosion allowable) extends beyond the property line. Because the existing ground profile beyond the property line is not available, the exact location of the long-term stable top of slope line (LTSTOS line) at the ground surface can not be determined.

The long-term stable top of slope line (LTSTOS line) at Sections A-A to I-I is located beyond the property line, i.e. to the east of the property line, and is located within WWPT property. As the existing ground profile beyond the property line is not available, the long-term stable top of slope line (LTSTOS line) at Sections A-A to I-I at the south part of the site can not be determined, and is not shown in Figure 1A.

9. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative

elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.



Fanyu Zhu, Ph.D., P.Eng.

DS Consultants Ltd. July 24, 2020

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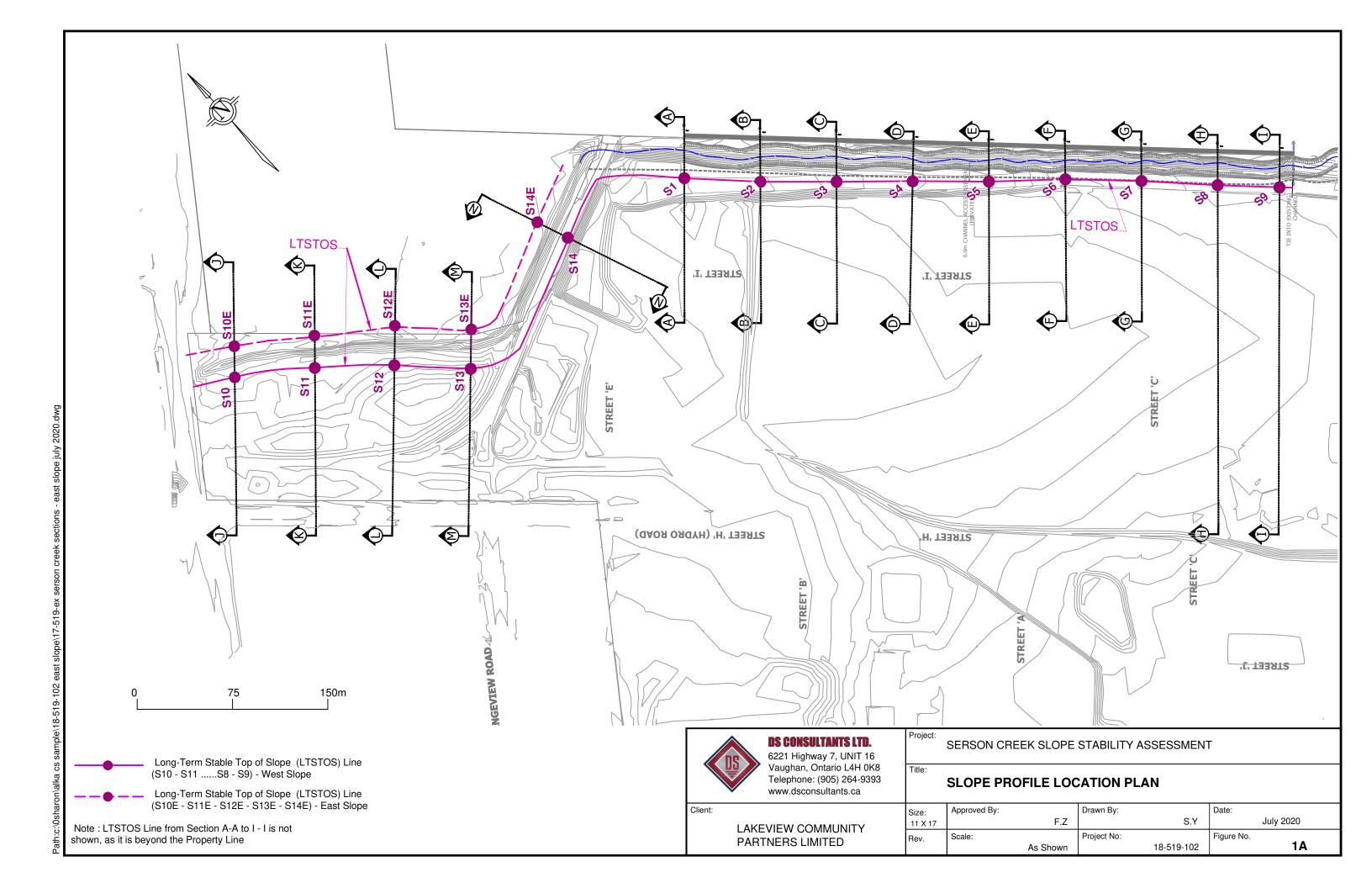
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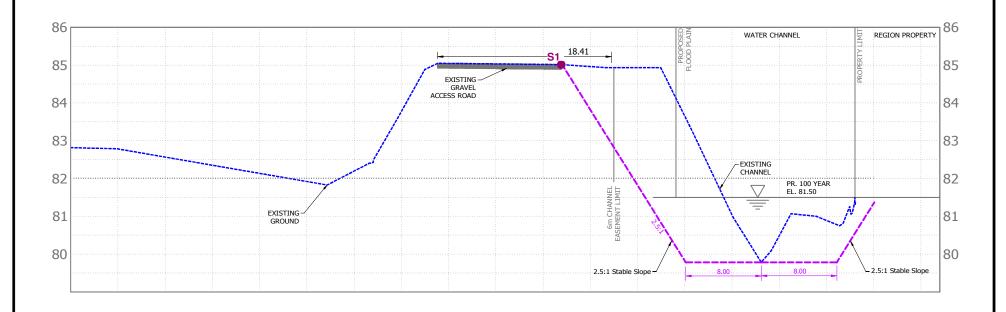
FIGURE 1A: SLOPE LOCATION PLAN

FIGURES 2A-15A: SLOPE PROFILES AT SECTIONS A-A TO N-N

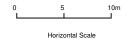
FIGURES 16A: STABILITY ANALYSIS RESULTS OF EXISTING SLOPE

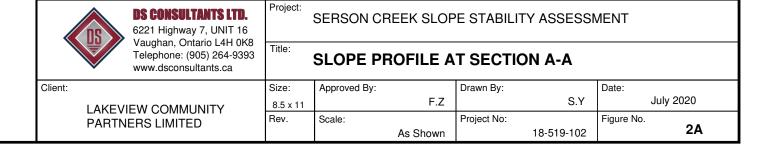
FIGURES 17A: STABILITY ANALYSIS RESULTS OF LONG-TERM STABLE SLOPE





SECTION A-A ALTERNATIVE STA.0+087









Vaughan, Ontario L4H 0K8

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Title:

ALTERNATIVE STA.0+147

SLOPE PROFILE AT SECTION B-B

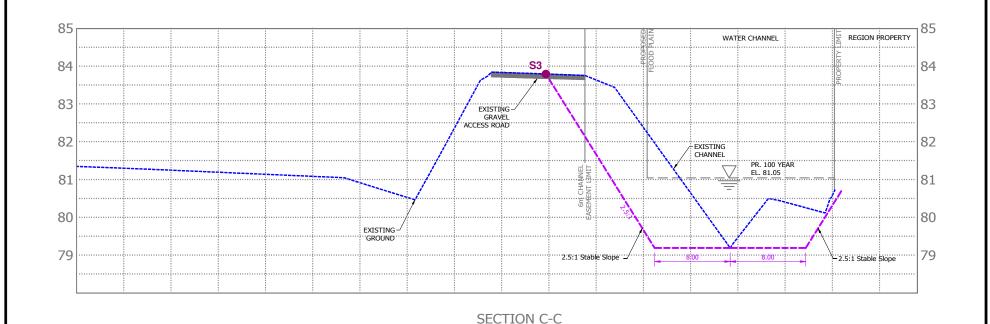
Client:

LAKEVIEW COMMUNITY PARTNERS LIMITED

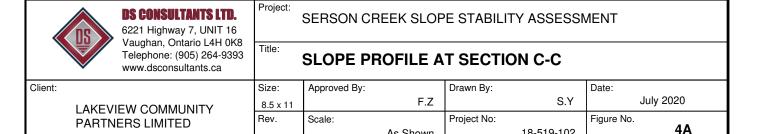
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Horizontal Scale

3A



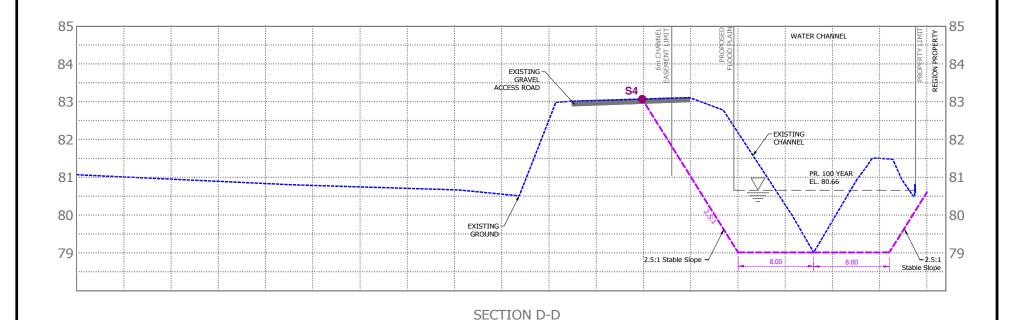
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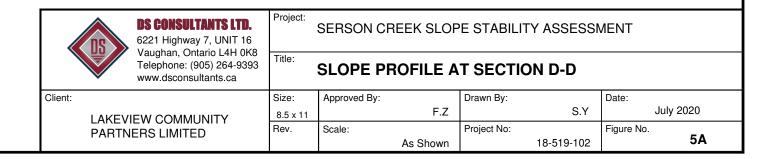
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Horizontal Scale

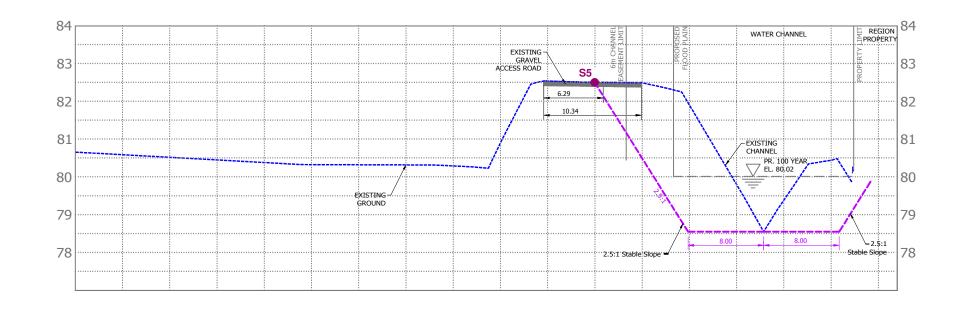
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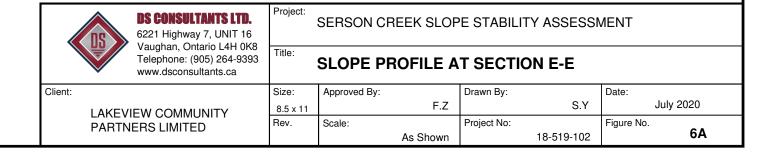
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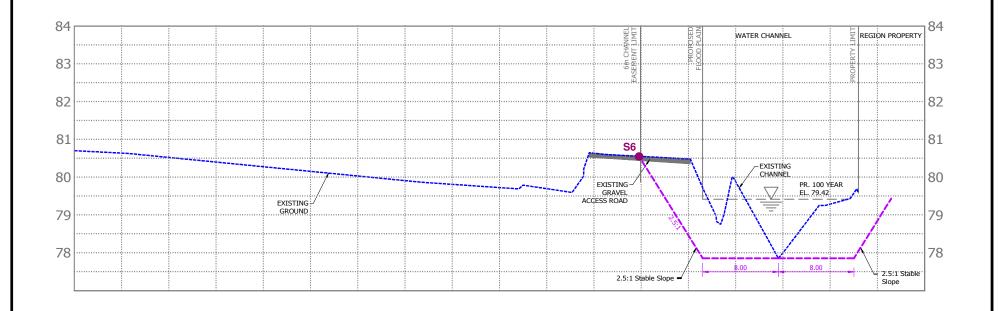
Horizontal Scale



SECTION E-E ALTERNATIVE STA.0+328



Horizontal Scale



SECTION F-F ALTERNATIVE STA.0+389



Horizontal Scale

July 2020

7A

Date:

18-519-102

Figure No.

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Title:

SLOPE PROFILE AT SECTION F-F

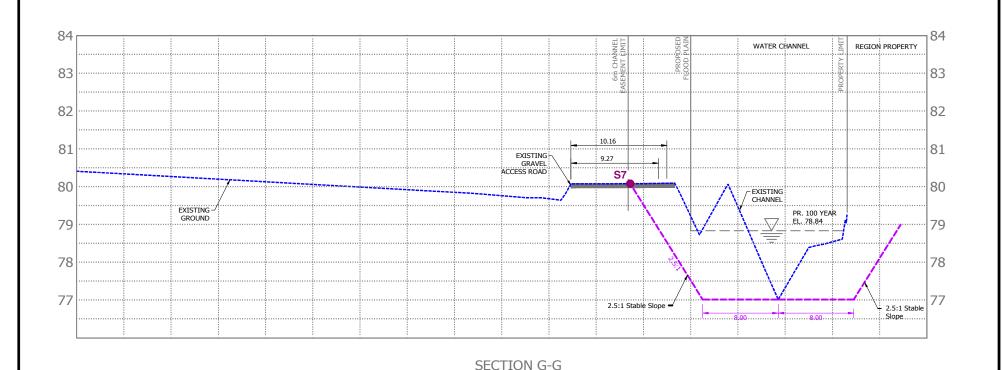
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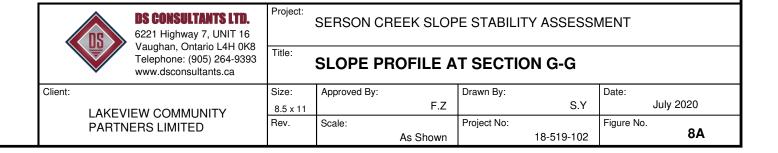
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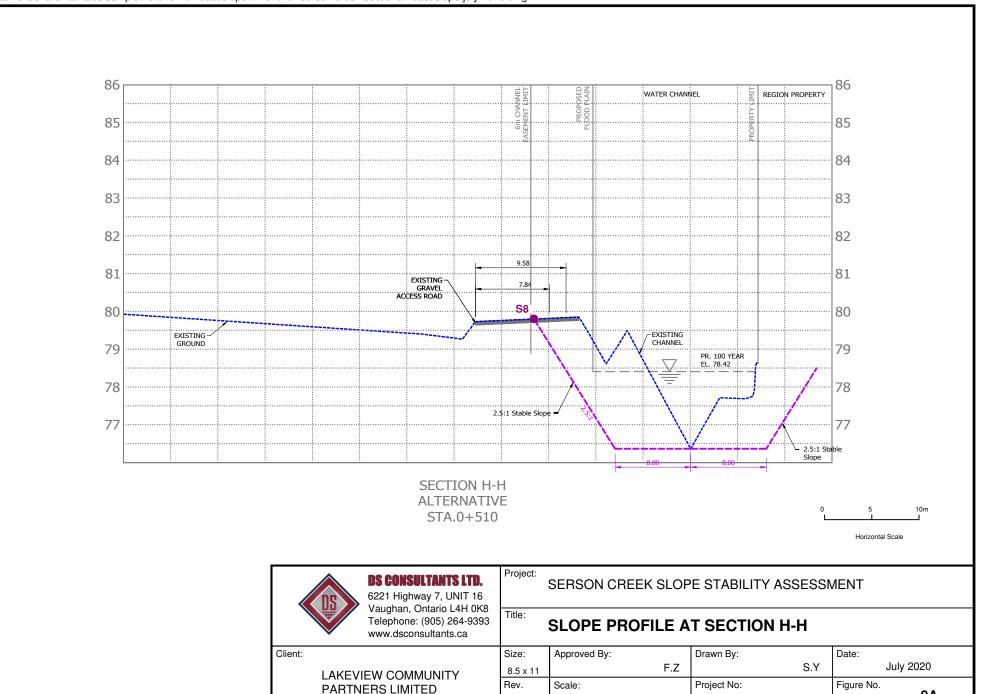
LAKEVIEW COMMUNITY PARTNERS LIMITED



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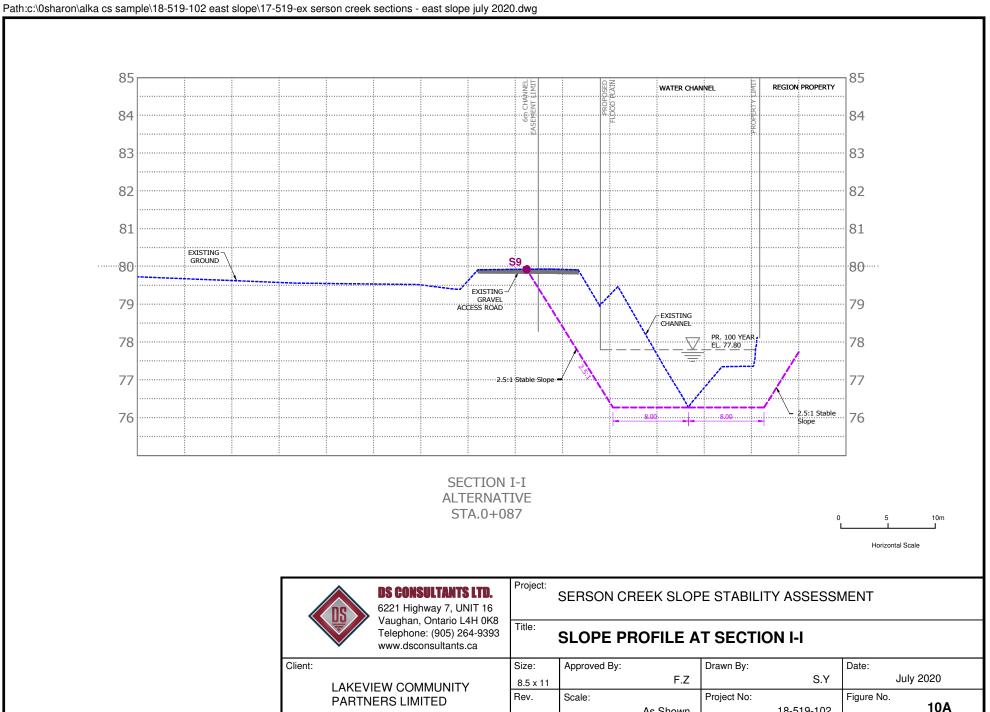
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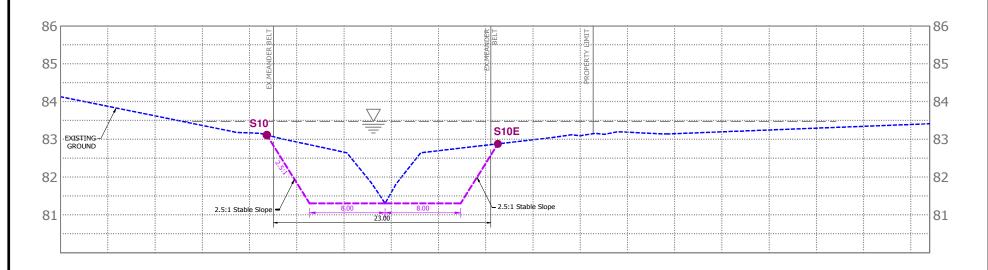
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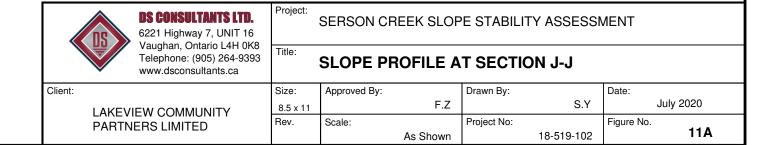
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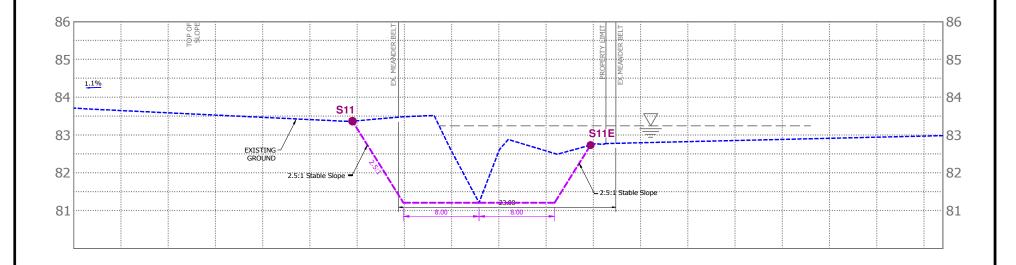
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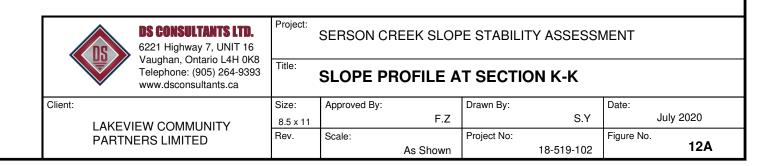




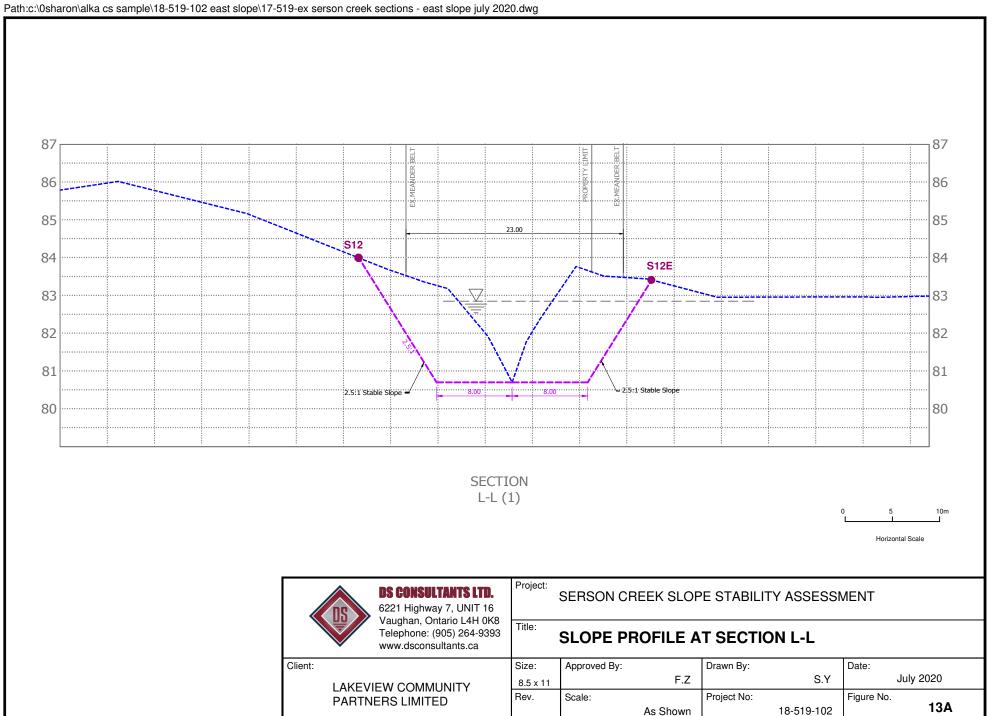


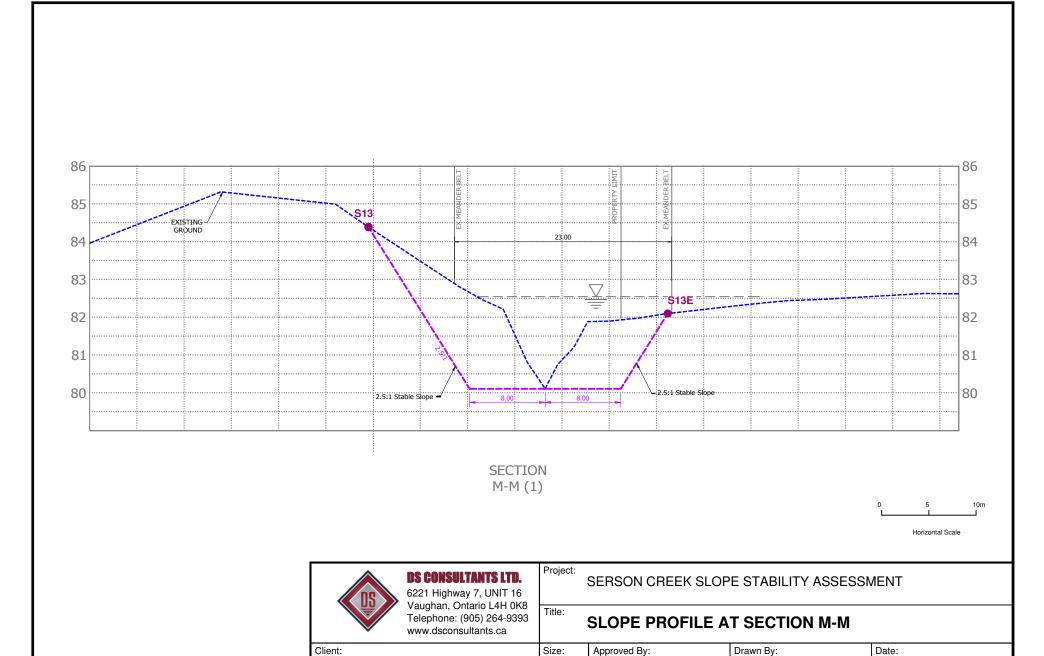


SECTION K-K (1)



Horizontal Scale





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PARTNERS LIMITED

July 2020

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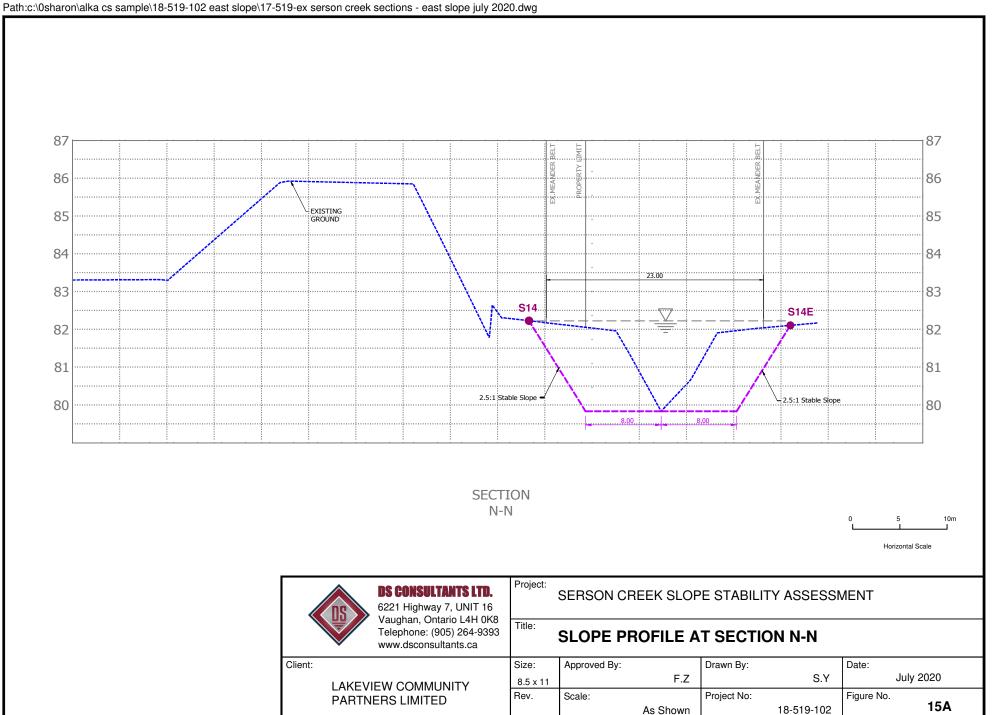
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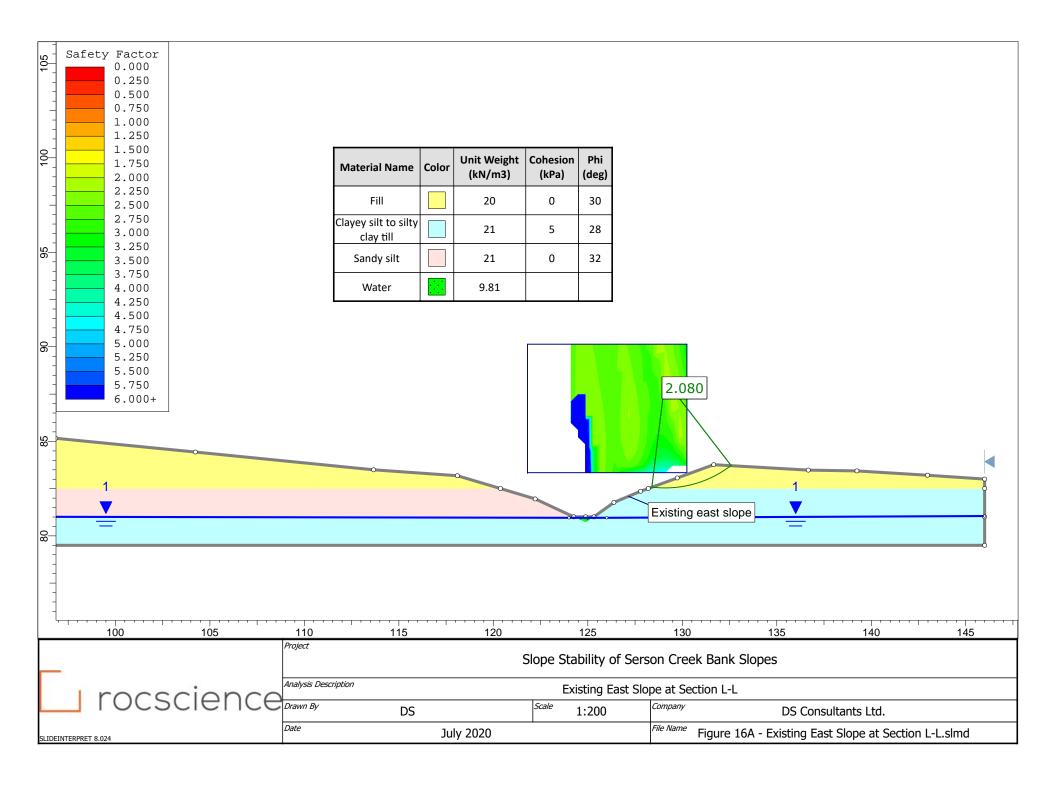
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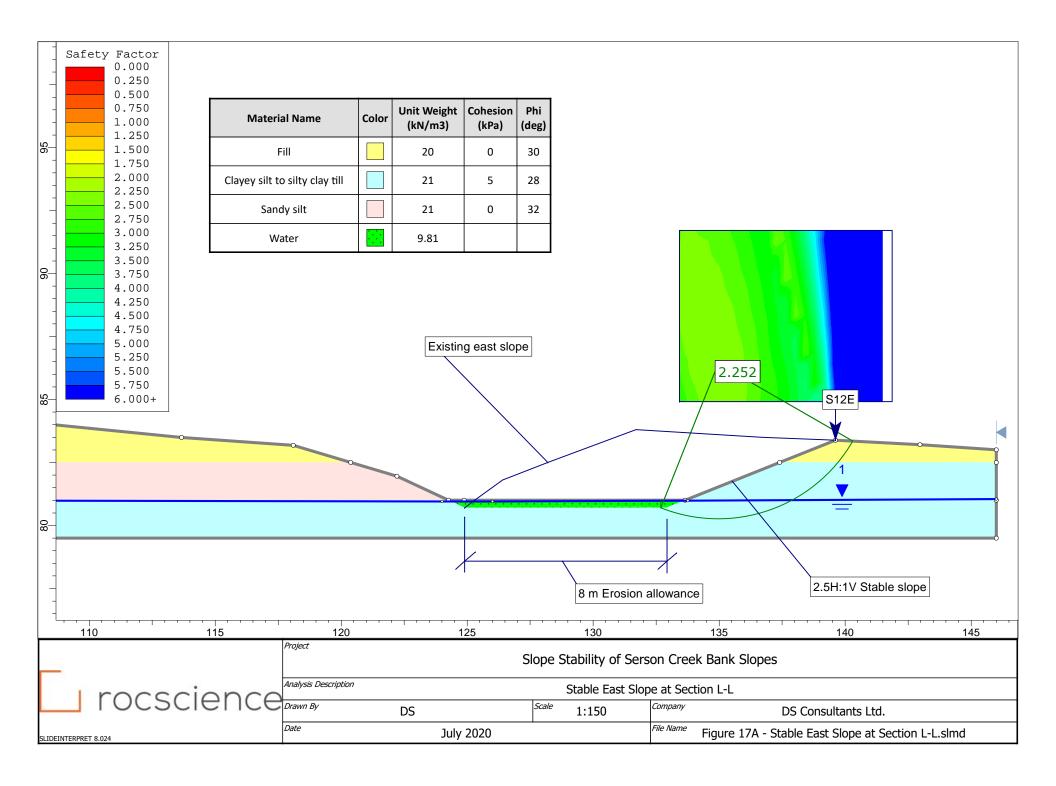
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Appendix I

Location Plan and Logs of Boreholes by DS Consultants Ltd.







Borehole Location



Client:

Project:
Geotechnical Investigation - Slope Stability at Serson Creek, ON

Borehole Location Plan

Image/Map Source: Google Satellite Image

Size: 8.5 x 11

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| | Approved By: | FZ | Drawn By: | MM | Date: | July, | 2020 |
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Lakeview Community Partners Limited

REF. NO.: 18-519-102



PROJECT: Slope Stability at Serson Creek

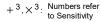
CLIENT: Lakeview Community Partners Limited

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

Diameter: 50 mm

| | SOIL PROFILE | | 5 | SAMPL | ES | | | DYNA RESIS | MIC CC STANCE | NE PE PLOT | NETRA | TION | | DI 40- | o NATI | URAL | | | F | METH | HANE |
|---------------------|--|-------------|--------|-------|--------------------|----------------------------|-----------|-----------------------|------------------|---------------|---------------------------|------|--------------------|--------|--------------------|-------------------------|--|---------------------------|----------------------------|------------------------|-----------------------------|
| (m) ELEV DEPTH 83.1 | DESCRIPTION | STRATA PLOT | NUMBER | ТҮРЕ | "N" BLOWS 0.3 m | GROUND WATER CONDITIONS | ELEVATION | SHEA O U | AR STI NCONF | 0 6 | 0 8 TH (kF + - × | 0 10 | ANE vity ANE | | CON \ TER CO | TENT W O ONTEN | LIQUID LIMIT W _L ——I IT (%) | POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (kN/m³) | AN GRAIN DISTRIE | ND N SIZE BUTIO %) |
| 89:0 | TOPSOIL 150mm | 1/1/2 | H | i i | - | $I: \mapsto :$ | 83 | | | | | | | | | | | | | OIT OIT | |
| 0.2 | FILL: clayey silt, trace topsoil, trace rootlets, brown, moist, stiff (possible weathered soil) | | 1 | SPT | 11 | | | - - - - | | | | | | | 0 | | | | | | |
| 0.8 | SILTY CLAY TILL: some sand, trace gravel/ cobble, brown, moist, hard | | 2 | SPT | 44 | | Slotte | t d pipe | in san | id | | | | (|) ŀ | | -1 | _ | | 11 15 | 46 |
| | | | 3 | SPT | 62 | | . 81 | - - - - - | | | | | | | o | | | | | | |
| 80.5 | grey below 2.3m | | 4 | SPT | 50/ 150mi | | | - - - | | | | | | 0 | | | | | | | |
| | Notes: 1) Piezometer installed at 2.3m depth. 2) Water level Readings: Date: Water Depth (mbgs) July 21, 2020 Dry | | | | | | | | | | | | | | | | | | | | |







PROJECT: Slope Stability at Serson Creek CLIENT: Lakeview Community Partners Limited

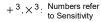
PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DRILLING DATA Method: Manual SPT

Diameter: 50 mm REF. NO.: 18-519-102

| | M: Geodetic | Date: Jul/07/2020 | | | | | | | | ENCL NO.: 3 | | | | | | | | | | |
|-----------------------|---|-------------------|----------|-------|--------------------|----------------------------|--------------|-------------|-------------------------------------|----------------|----------|----------|---------------|-----------------------------------|-----|-----------------------------|-----------------------------------|---------------------------|-------------------------|------------------------------|
| BORE | HOLE LOCATION: See Drawing 1 N 4 SOIL PROFILE | | <u> </u> | DYNA | MIC CO | ONE PE | NETR/ | ATION | | | | | | <u> </u> | | | | | | |
| (m) | GOIL FROI ILE | LOT | | SAMPL | | WATER NS | z | | 20 4 | 10 6 | 3 0 | 30 1 | 00 | PLASTI LIMIT W _P | COV | URAL STURE ITENT W | LIQUID LIMIT W _L | POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (KN/m³) | METHANE AND GRAIN SIZ |
| ELEV DEPTH 82.0 | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" BLOWS 0.3 m | GROUND WATER CONDITIONS | ELEVATION | 0 U | AR STI INCONF IUICK T 20 4 | INED RIAXIA | + L × | & Sensit | ANE ivity ANE | ₩A | | O | | POCKE (Cu) | NATURAL (kN/ | DISTRIBUT (%) GR SA SI |
| 0.0 81.8 0.2 | TOPSOIL 200mm FILL: clayey silt, trace gravel, trace topsoil/ organics, brown, moist, stiff | <u>11/2</u> | 1 | SPT | 9 | | | - | | | | | | | 0 | | | | | |
| | (possible weathered soil) | | | | | | | - - - | | | | | | | | | | | | |
| | | | 2 | SPT | 13 | | 81 Slotte | | in sar | nd | | | | | | 0 | | _ | | |
| 80.5 | SILTY CLAY TILL: some sand, trace gravel/ cobble, sand seams, | | | | | | | - - - | | | | | | | | | | | | |
| | brown, moist, very stiff to hard | | 3 | SPT | 28 | | 80 | [-) | | | | | | (| | | | | | |
| 79.5 2.5 | grey below 2.3m END OF BOREHOLE: | | 4 | SPT | 50/ 75 | | | - - - | | | | | | | o | | | | | |
| | 1) Piezometer installed at 2.3m depth. 2) Water level Readings: Date: Water Depth (mbgs) July 21, 2020 Dry | | | | | | | | | | | | | | | | | | | |
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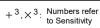
PROJECT: Slope Stability at Serson Creek

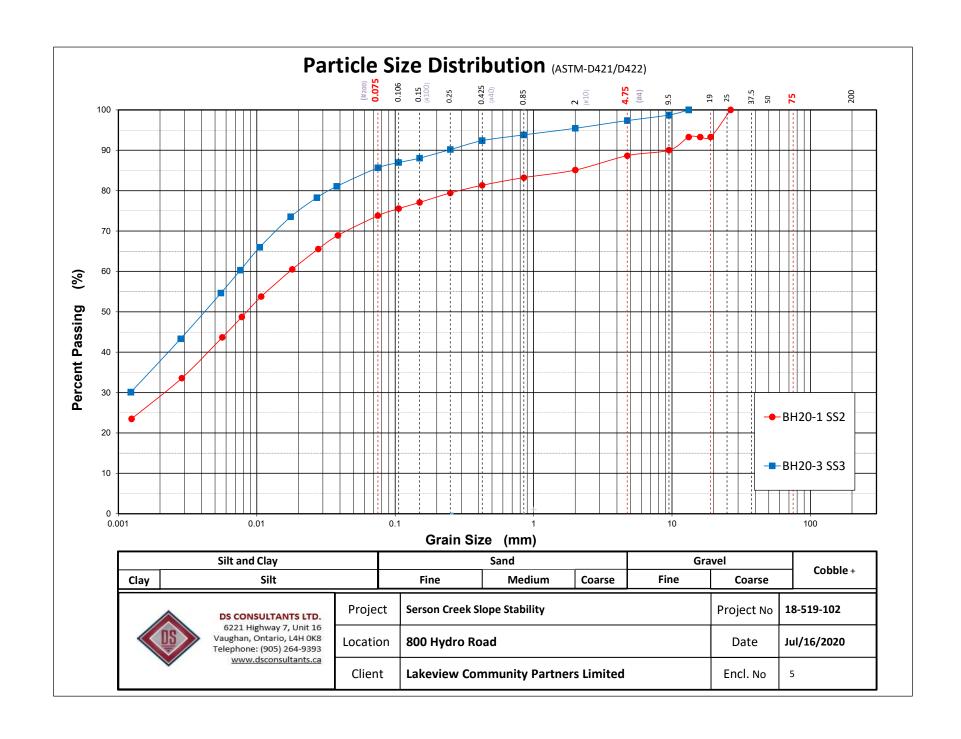
CLIENT: Lakeview Community Partners Limited

Method: Manual SPT

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GRAPH NOTES





Appendix II

Location Plan and Logs of Previous Boreholes by WSP



REF. NO.: 161-14544-00



PROJECT: Geotechnical Investigation - GE Booth WWTP

CLIENT: Region of Peel

DATUM: Geodetic

Method: Solid Stem Auger

PROJECT LOCATION: 1300 Lakeshore Road E, Mississauga, ON Diameter: 115mm

> Date: Oct/24/2016 ENCL NO.: 2

| BHL | OCATION: N 4825675 E 617129 | | | | | | | D) A I A I | 110.00 | NE DE | IETD A | TION | | | | | | | | | | _ | | | |
|----------------------------|--|-------------|--------|--|----------------|----------------------------|-----------|------------|---------|-------------------------|--------|------------------------|-----------------|---------------------|----------|--------|---|---------------------------|--------------------------|--------------|----------------------------------|----|--|-------|--|
| | SOIL PROFILE | | S | SAMPLES DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC MATUR. PLASTIC MOISTI | | | | | | SAMPLES RESISTANCE PLOT | | | RESISTANCE PLOT | | | | PLASTIC NATURAL LIQUID LIMIT CONTENT LIMIT | | | | | ΤM | | MARKS | |
| (m) ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | | BLOWS 0.3 m | GROUND WATER CONDITIONS | ELEVATION | SHEA | AR STI | RENG INED | TH (kf | Pa) FIELD V. & Sensiti | ANE vitv | W _P ⊢ | CON V | w > | LIMIT W _L ——————————————————————————————————— | POCKET PEN. (Cu) (kPa) | ATURAL UNIT \ (KN/m³) | GRA DISTR | AND IN SIZE RIBUTIC (%) | | | | |
| 79.5 | Ground Surface | STR/ | NOM | TYPE | ż | GRO | ELE | ● Ql | JICK TH | RIAXIAL | . × | LAB VA | ANE | ı | | | 30 | | 2 | GR SA | A SI | CL | | | |
| 79.9 - 78.3 - 0.3 | | • | 1 | SS | 29 | | 79 | | | | | | | 0 | | | | | | | | | | | |
| 78. <u>7</u> 0.8 | FILL: sand, some silt, some gravel, brown, moist, compact FILL: clayey silt to silty clay, some sand, trace to some gravel, brown to | | 2 | SS | 29 | | 73 | | | | | | | 0 | | | | | | | | | | | |
| - | sand, trace to some gravel, brown to grey, moist, firm to hard some gravel above 1.5 m | | | | 29 | - | 78 | | | | | | | Ŭ | | | | | | | | | | | |
| - - - 2 | trace organics below 1.5 m | | 3 | SS | 6 | | | | | | | | | | | | | | | | | | | | |
| | inferred cobble/boulder | | 4 | SS | 50/ 50mm | | 77 | | | | | | | | | 0 | | | | | | | | | |
| ³ 76.4 - 3.1 | SANDY SILT: trace clay, contains | | | | | - | | | | | | | | | | | | | | | | | | | |
| - | sand layers, brown, moist to wet, very dense | | 5 | SS —— | 54 | | 76 | | | | | | | | 0 | | | | | 0 38 | 3 54 | 8 | | | |
| _4 - - | | | | | | | | | | | | | | | | | | | | | | | | | |
| 74.9 - 4.6 | | 0 | 6 | SS | 50/ 125mn | M | 75 | | | | | | | 0 | | | | | | | | | | | |
| - - - - | wet below 5.2 m | | | | | | 74 | - | | | | | | | | | | - | | | | | | | |
| - <u>6</u> - - | | | 7 | SS | 50/ | | | | | | | | | 0 | | | | | | | | | | | |
| - - - - - | | φ | | | 25mm | | 73 | - | | | | | | | | | | | | | | | | | |
| 71.9 | | | | | | | 72 | | | | | | | | | | | | | | | | | | |
| 7.6 | | | | | | | | | | | | | | | | | | | | | | | | | |
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 $\frac{\text{GRAPH}}{\text{NOTES}} \quad +^{\,3}, \times^{\,3} \colon \stackrel{\text{Numbers refer}}{\text{to Sensitivity}}$

○ ^{ε=3%} Strain at Failure



LOG OF BOREHOLE BH16-2 1 OF 2 PROJECT: Geotechnical Investigation - GE Booth WWTP CLIENT: Region of Peel Method: Hollow Stem Auger PROJECT LOCATION: 1300 Lakeshore Road E, Mississauga, ON Diameter: 203mm REF. NO.: 161-14544-00 DATUM: Geodetic Date: Oct/24/2016 ENCL NO.: 3 BH LOCATION: N 4825731 E 617094 DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE CONTENT GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND NATURAL UNIT \ (kN/m³) 20 40 60 80 100 (m) GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa) DISTRIBUTION **DESCRIPTION** NUMBER O UNCONFINED (%) WATER CONTENT (%) × LAB VANE TYPE QUICK TRIAXIAL 80.1 Ground Surface 40 60 80 100 10 20 30 GR SA SI CL 80 GRANULAR: 150 mm (sand and 12 1 SS 0 gravel) FILL: clayey silt, some sand, trace gravel, trace organics, brown to grey, moist, firm to very stiff 2 SS 9 79 7 3 SS 78 77.8 CLAYEY SILT TILL: some sand, trace gravel, brown, moist, very stiff 4 SS 28 77.0 77 50/ SANDY SILT TILL: trace clay, 5 SS 0 some gravel, occasional 100mn cobble/boulder, brown, moist, very 76 6 SS 50/ 0 grey below 4.6 m 50mr W. L. 75.1 m Nov 03, 2016 74.0 74 SILTY SAND: trace clay, contains silt seams, grey, wet to saturated, SS 34 0 dense **SAND:** coarse, some silt, trace clay, trace gravel, embedded layers SS 55 7 77 12 4 of silty sand till, grey, wet, very 72 dense ⁹ 71.0 71 GRAVELLY SAND: trace silt, trace clay, grey, saturated, dense 9 45 SS Q 0.0 70 69.4 SANDY SILT TILL: trace clay, 10 SS / 50/ 10.7 some gravel, sand seams/layers, 50mn 69 grey, moist, very dense

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement $\stackrel{1st}{\underline{\vee}}$ $\stackrel{2nd}{\underline{\vee}}$ $\stackrel{3rd}{\underline{\vee}}$ $\stackrel{4th}{\underline{\vee}}$

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity



PROJECT: Geotechnical Investigation - GE Booth WWTP

CLIENT: Region of Peel Method: Hollow Stem Auger

PROJECT LOCATION: 1300 Lakeshore Road E, Mississauga, ON Diameter: 203mm REF. NO.: 161-14544-00

DATUM: Geodetic Date: Oct/24/2016 ENCL NO.: 3

| BH LOCATION: N 4825731 E 617094 | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|---|-------------|--------|------|------------------------|----------------------------|-----------|--|--------|-----------------|--------|--------------------------------------|-------------|--|--------|-------|--|-------|---------------------|---------|------|
| | SOIL PROFILE | | S | AMPL | .ES | | | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | | PLASTIC NATURAL LIQUID | | | , | ı | REMARI | ks | |
| (m) | DESCRIPTION | STRATA PLOT | | | BLOWS 0.3 m | GROUND WATER CONDITIONS | | 20 40 60 80 100 | | | | | 00 | PLASTIC NATURAL LIQUID LIMIT CONTENT LIMIT | | | POCKET PEN. (Cu) (kPa) NATURAL UNIT WT | EN. | AND | | |
| ELEV | | | | | | D W | NOI | SHEA | R STI | RENG | TH (kF | Pa) | ANE | W_P W W_L | | | EXE RP | RAL L | GRAIN S DISTRIBU | | |
| DEPTH | DESCRIPTION | ATA | NUMBER | ш | 9 <u>R</u> 0 | N DC | ELEVATION | 0 UN | ICK TE | INED RIAXIAI | + | Pa) FIELD V & Sensiti LAB V | vity ANE | WA ⁻ | TER CC | ONTEN | T (%) | PO () | MATU. | (%) | |
| | Continued | | Ŋ | TYPE | ž | GR | ELE | 2 | 0 4 | 0 6 | 0 8 | 0 10 | 00 | 1 | 0 2 | 20 : | 30 | | | GR SA S | ı CL |
| 67.9 | | 0 | | | | | 68 | | | | | | | | | | | П | | | |
| 67:7 | | ΙφΙ | 11 | SS | 50/ 75mm | | | | | | | | | 0 | | | | | Ш | | |
| 12.4 | END OF THE BOREHOLE | | | | | | | | | | | | | | | | | | | | |
| | Note: 1) 50 mm monitoring well was | | | | | | | | | | | | | | | | | | | | |
| | 1) 50 mm monitoring well was installed upon completion of drilling. 2) Weter Level Boodings. | | | | | | | | | | | | | | | | | | | | |
| | installed upon completion of drilling. 2) Water Level Readings: Date W.L.Depth (m) | | | | | | | | | | | | | | | | | | | | |
| | November 1, 2016 5.0 November 3, 2016 5.0 | | | | | | | | | | | | | | | | | | | | |
| | November 3, 2010 3.0 | | | | | | | | | | | | | | | | | | | | |
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 $\frac{\text{GRAPH}}{\text{NOTES}} \quad +^{\,3}, \times^{\,3} \colon \stackrel{\text{Numbers refer}}{\text{to Sensitivity}}$

○ ^{ε=3%} Strain at Failure



LOG OF BOREHOLE BH16-3 1 OF 1 PROJECT: Geotechnical Investigation - GE Booth WWTP CLIENT: Region of Peel Method: Hollow Stem Auger PROJECT LOCATION: 1300 Lakeshore Road E, Mississauga, ON Diameter: 203mm REF. NO.: 161-14544-00 DATUM: Geodetic Date: Oct/20/2016 ENCL NO.: 4 BH LOCATION: N 4825803 E 617009 DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND NATURAL UNIT ((kN/m³) 20 40 60 80 100 (m) STRATA PLOT GRAIN SIZE SHEAR STRENGTH (kPa) W_P BLOWS 0.3 m DISTRIBUTION DESCRIPTION NUMBER O UNCONFINED (%) WATER CONTENT (%) × LAB VANE TYPE QUICK TRIAXIAL 40 60 80 100 10 20 30 GR SA SI CL 81.0 Ground Surface TOPSOIL: 100 mm FILL: sand and gravel, trace 19 1 SS topsoil, trace rootlets, brown, moist, compact FILL: clayey silt, sandy, trace 0.8 80 gravel, trace organics, brown, moist, 2 SS 17 79.8 very stiff CLAYEY SILT: trace sand, contains silt seams, brown, moist, very stiff to hard 3 SS 36 0 79 78.7 CLAYEY SILT TILL: some sand, trace gravel, occasional cobble/boulder, brown, moist, hard 4 SS 39 78 **SANDY SILT:** seams of clayey silt, brown, moist to wet, very dense SS 56 5 0 77 6 SS 70 0 grey, wet below 4.6 m W. L. 76.4 m Nov 03, 2016 7 SS 60 75.7 SILTY SAND: trace clay, trace gravel, grey, wet, very dense SS 57 8 0 74.9 75 SAND: trace silt, trace clay, seams of clayey silt, trace gravel, grey, wet, 9 SS 52 verv dense 74.1 SILTY SAND: trace clay, grey, 74 saturated, dense to very dense 10 SS 46 0 seams of clayey silt above 6.9 m 11 SS 52 73 12 SS 55 72 ⁹ 71.9 SILT: some sand, trace clay, grey, saturated, very dense 13 SS 55 71.3 END OF THE BOREHOLE Notes: 1) 50 mm monitoring well was installed upon completion of drilling.
2) Water Level Readings:
Date W.L.Depth (m) November 1, 2016 November 3, 2016 4.6 4.7

GROUNDWATER ELEVATIONS Measurement $\stackrel{1st}{\underline{\vee}}$ $\stackrel{2nd}{\underline{\vee}}$ $\stackrel{3rd}{\underline{\vee}}$ $\stackrel{4th}{\underline{\vee}}$ **GRAPH** NOTES

+ ³, × ³: Numbers refer to Sensitivity



PROJECT: Geotechnical Investigation - G. E. Booth (Lakeview) WWTP - Watermain Extension REF. NO.: 171-16737-00 Method: Solid Stem Auger ENCL NO.: 1 ORIGINATED BY FO PROJECT LOCATION: 1300 Lakeshore Road E, City of Mississauga, ON Diameter: 150mm MW DATUM: Geodetic Date: Jan/19/2018 COMPILED BY LC BH LOCATION: See Borehole Location Plan N 4825834.795 E 617213.0793 Eqipment: Pontil Drilling CME 75 (Track) CHECKED BY DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES ASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIQUID LIMIT POCKET PEN. (Cu) (kPa) AND 20 40 60 80 100 (m) STRATA PLOT GRAIN SIZE SHEAR STRENGTH (kPa) NATURAL UN (kN/m³) BLOWS 0.3 m DISTRIBUTION DESCRIPTION NUMBER O UNCONFINED (%) WATER CONTENT (%) × LAB VANE TYPE QUICK TRIAXIAL 78.9 Ground Surface 78.9 TOPSOIL: 150mm. 40 60 80 100 10 20 30 GR SA SI CL FILL: silty clay, trace sand, trace SS 14 0 rootlets, moist, stiff to hard 78 77.8 1.1 2 SS 34 FILL: sandy silt, some clay, brown, 77.5 moist, dense FILL:silty clay, trace sand, trace gravel, brown, moist, very stiff 3 SS 25 77 76.3 4 SS 24 SILTY CLAY TILL: some sand, trace gravel, trace oxidized, grey, moist, very stiff 5 SS 17 0 9 10 56 25 75.1 SILTY CLAY TILL/SHALE 3.8 75 **COMPLEX:** some sand to sandy, trace gravel, contains 50/ 6 SS 75mn boulder/cobbles and rock fregments/slabs, grey, moist, hard 100/ 7 SS 125mn 74 50/ boulder/cobble (inferred) 8 SS 0 lSpoon 50mn bouncing 73 50/ 9 SS 0 **END OF BOREHOLE** Note: 1) Borehole was dry and caved in at 5.6m upon completion.

GROUNDWATER ELEVATIONS Shallow/ Single Installation Deep/Dual Installation Deep/Dual Installation



GRAPH NOTES

+ ³, × ³: Numbers refer to Sensitivity



PROJECT: Geotechnical Investigation - G. E. Booth (Lakeview) WWTP - Watermain Extension REF. NO.: 171-16737-00 Method: Solid Stem Auger ENCL NO.: 2 ORIGINATED BY FO PROJECT LOCATION: 1300 Lakeshore Road E, City of Mississauga, ON Diameter: 150mm MW DATUM: Geodetic Date: Jan/19/2018 COMPILED BY LC BH LOCATION: See Borehole Location Plan N 4825807.268 E 617292.627 Eqipment: Pontil Drilling CME 75 (Track) CHECKED BY DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES ASTIC NATURAL MOISTURE CONTENT REMARKS GROUND WATER CONDITIONS LIQUID LIMIT POCKET PEN. (Cu) (kPa) AND NATURAL UNIT ((kN/m³) 20 40 60 80 100 (m) STRATA PLOT GRAIN SIZE SHEAR STRENGTH (kPa) BLOWS 0.3 m DISTRIBUTION **DESCRIPTION** NUMBER O UNCONFINED (%) WATER CONTENT (%) QUICK TRIAXIAL X LAB VANE TYPE 78.7 Ground Surface
78.8 ASPHALT: 100mm. 40 60 80 100 10 20 30 GR SA SI CL 7**9.0** 0.1 78.4 **GRANULAR BASE/SUBBASE:** 1 SS 50 gravelly sand, trace silt, moist, very dense 78 FILL: clayey silt to silty clay, trace sand, moist, firm to stiff 2 SS 11 77 3 SS 7 0 76.4 2.3 SILTY CLAY: trace sand, trace gravel, brown, 4 SS 16 0 1 76 23 moist, very stiff 76 5 SS 21 0 74.9 SILTY CLAY TILL: some sand to sandy , trace gravel, 50/ 6 SS 0 grev. moist, hard 125mr 74.2 SILTY CLAY TILL/SHALE 74 COMPLEX: some sand to sandy, 50/ SS 0 trace gravel, contains 100mr boulder/cobbles and rock fregments/slabs, grey, moist, hard 50/ 8 SS 0 75mn 73 50/ 9 SS 0 **END OF BOREHOLE** Note: 1) Borehole was dry and caved in at 5.5m upon completion.

GROUNDWATER ELEVATIONS Shallow/ Single Installation Deep/Dual Installation Deep/Dual Installation



GRAPH NOTES

+ ³, × ³: Numbers refer to Sensitivity



PROJECT: Geotechnical Investigation - G. E. Booth (Lakeview) WWTP - Watermain Extension REF. NO.: 171-16737-00 Method: Solid Stem Auger ENCL NO.: 4 ORIGINATED BY FO PROJECT LOCATION: 1300 Lakeshore Road E, City of Mississauga, ON Diameter: 150mm MW DATUM: Geodetic Date: Jan/19/2018 COMPILED BY LC BH LOCATION: See Borehole Location Plan N 4826075.007 E 616967.0517 Eqipment: Pontil Drilling CME 75 (Track) CHECKED BY DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES ASTIC NATURAL MOISTURE CONTENT REMARKS LIQUID LIMIT GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND 20 40 60 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa) W_P NATURAL UN (kN/m³) DISTRIBUTION DESCRIPTION NUMBER O UNCONFINED (%) WATER CONTENT (%) × LAB VANE TYPE QUICK TRIAXIAL 40 60 80 100 10 20 30 GR SA SI CL 82.9 Ground Surface 80.0 ASPHALT: 125mm. -cement **GRANULAR BASE/SUBBASE:** 50 sand and gravel, trace silt, moist, 1 SS 0 very dense FILL: sand, some gravel, trace silt, moist, very dense 2 SS 49 0 boulder/cobble (inferred) <u>81.5</u> Auger grinding at 1.35m FILL: silty clay, trace sand, trace rootlets, brown, moist, very stiff 3 SS 17 81 holeplug 4 SS 26 0 trace sandy silt layers below 2.6m 80 79.5 5 SS 22 0 3.4 SILTY CLAY: trace sand, trace gravel, brown, 79.1 _moist, very stiff 3.8 SAND: some silt to silty, trace clay, 79 greyish brown, moist, dense to very 6 SS 50 0 sand 7T SS 35 0 78 77.9 5.0 7B SS 0 SILTY CLAY: trace sand, trace gravel, brown to 77.6 grey, moist, hard 50/ 8T SS SILTY SAND TO SAND AND SILT: 75mn trace clay, brown to grey, moist, dense to very dense 8B SS W. L. 77.2 m 0 trace clayey silt layers from 5.6m to Jan 31<u>,</u> 2018 5.8m -screen 0 51 46 3 50 9 SS 76 10 SS 30 -sand⁵ 74 7 END OF BOREHOLE Notes: 1) Borehole caved in at 7.5m upon 2) 50mm monitoring well installed upon completion of drilling. upon completion of diameg.
3) Water Level Readings:
Date W. L. Depth (m) Jan 31, 2018 5.68m + ³, × ³: Numbers refer \bigcirc $^{\pmb{\epsilon}=3\%}$ Strain at Failure

GRAPH

NOTES

to Sensitivity

GROUNDWATER ELEVATIONS

Shallow/ Single Installation Deep/Dual Installation Deep/Dual Installation

Appendix III

Site Photographs (taken on July 20, 2020)

DS Consultants Ltd. July 24, 2020



Photo 1: Creek and concrete culvert at Lakeshore Blvd (looking north - upstream)



Photo 2: Creek conditions at south of Lakeshore Blvd (looking south - downstream)



Photo 3: Top of slope area at BH20-1 (looking south)



Photo 4: Creek conditions near BH20-1 (looking south - downstream)



Photo 5: Top of slope conditions to north of Section L-L (looking north toward Lakeshore Blvd)



Photo 6: Creek conditions to north of Section L-L (looking northeast)



Photo 7: Top of slope area to north of Section M-M (looking northwest)



Photo 8: Top of slope conditions in area of and to west of Section N-N (looking east)



Photo 9: Creek conditions at west of Section N-N (looking west)



Photo 10: Creek conditions to east of Section N-N and to north of bridge (looking west)



Photo 11: Road Bridge to north of Section A-A (looking west)



Photo 12: Creek and east slope conditions in Reach S2 (looking south from road bridge)



Photo 13: Creek conditions to south of road bridge (looking north - upstream)



Photo 14: Creek and slope conditions to south of road bridge (looking south – downstream)



Photo 15: East slope near fence at north part of Reach S2 area (looing south - downstream)



Photo 16: Conditions to east of fence at north part of Reach S2 area (looing south)



Photo 17: Creek conditions at middle-north part of Reach S2 (looking north - upstream)



Photo 18: Creek conditions at middle-north part of Reach S2 (looking south - downstream)



Photo 19: East slope near fence at middle-north part of Reach S2 (looking north - upstream)



Photo 20: East slope near fence at middle-north part of Reach S2 (looking south - downstream)



Photo 21: East slope near fence at middle-south part of Reach S2 (looking north - upstream)



Photo 22: East slope near fence at middle-south part of Reach S2 (looking south - downstream)



Photo 23: Creek conditions at middle-south part of Reach S2 (looking north - upstream)



Photo 24: Creek conditions at middle-south part of Reach S2 (looking south - downstream)



Photo 25: East slope near fence at south part of Reach S2 (looking northeast)



Photo 26: Creek conditions at south part of Reach S2 (looking north - upstream)



Photo 27: South end of Reach S2 (looking southeast from west side of creek)



Photo 28: South part of Reach S2 (looking northeast from west side of creek)